

EVALUATION OF CHILDREN WITH CHRONIC
ABDOMINAL PAIN

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INTRODUCTION

Chronic abdominal pain is defined^{1,2} as abdominal pain, continuous or recurrent, lasting for two weeks or longer. Exact prevalence of chronic abdominal pain is not known. It seems to account for 2 to 4% of all pediatric outpatient visits^{3,4}. This condition has also been referred to as 'recurrent abdominal pain', in the literature. Apley and Naish first introduced it in pediatric literature in the year 1950⁵. Chronic abdominal pain can be due to both organic and functional disorders.

The following five components have been mentioned and considered in evaluating these children² ; the same have been followed in this study:

1. History
2. Physical examination
3. Laboratory tests individualized to indication
4. Imaging studies individualized to indication.
5. Empiric intervention.

In Chronic abdominal pain symptoms which are known to be associated with organic disease and referred as alarm symptoms are vomiting, diarrhea, unexplained fever, persistent right upper or right lower quadrant pain, weight loss and gastrointestinal blood loss. This condition has been greatly discussed and studied by paediatricians and medical gastroenterologists. Most of the published literature is from the medical colleagues. Available literature published by them has repeatedly mentioned functional gastrointestinal disorders as the cause of this pain, which includes non-ulcer dyspepsia, Irritable Bowel Syndrome or abdominal migraine. This being the case there has been debate regarding the need for evaluating these patients with laboratory tests and imaging studies.

But the surgeons have approached this problem differently. Various imaging modalities and Diagnostic laparoscopy have been used which has increased the yield of diagnosing organic diseases in these studies. Chronic or recurrent appendiceal inflammation has been shown to be one of the causes of this pain in various published studies^{6,7,8}. There are no clear guidelines in literature regarding the investigations needed in evaluating these patients. There are no studies quoting the differential diagnosis in these patients.

This study has made an attempt to determine the differential diagnosis in patients presenting to paediatric surgical outpatient department with chronic abdominal pain and to establish guidelines regarding evaluation and management.

AIMS OF THE STUDY

To determine the differential diagnosis of chronic abdominal pain.

To determine the yield of various investigatory modalities in managing chronic abdominal pain.

To determine the role of Diagnostic laparoscopy in managing patients with chronic abdominal pain.

To determine if appendicectomy is indicated in patients presenting with chronic abdominal pain when no conclusive diagnosis is reached with investigations.

MATERIALS AND METHODS

Study type: Prospective study.

Study Group: 60 consecutive patients presenting to the paediatric surgical outpatient department with history of abdominal pain lasting for more than two weeks.

Inclusion criteria: All patients presenting to our department with history of recurrent episodes of abdominal pain lasting more than 2 weeks duration.

Exclusion criteria: Patients with chronic abdominal pain but presenting for the first time with acute symptoms and requiring immediate intervention.

Study Period: August 2005 to January 2006 (6 months)

Study center: Department of Pediatric Surgery, Coimbatore Medical College Hospital, Coimbatore.

Methodology:

Detailed History was obtained which included the following:

Site and type of pain

Aggravating or relieving factors

Presence of associated symptoms like vomiting, loose stools, urinary symptoms, fever, loss of weight, h/o of passage of worms in stool.

Thorough physical examination was performed in all patients and the following were recorded:

General physical examination

Abdominal site of tenderness or mass

Examination of the hernial orifices, and

Rectal examination if indicated.

All data were recorded in the proforma sheet, which is enclosed.

Patients were subjected to the following investigations:

Compulsory Investigations:

Complete Haemogram

S. Amylase

ESR

Urine RE

Motion RE

Mantoux test

USG Abdomen

Optional investigations when indicated:

Urine C/s

Upper GI endoscopy

Contrast studies

CT scan

All patients were given antihelminthics. Symptomatic treatment included analgesics in all and H2 receptor blockers when patients presented with epigastric pain. Patients were reviewed after a fortnight.

Patients were then classified under following four groups:

Group I - Investigations lead to a specific diagnosis, patients were treated accordingly.

Group II– Investigations were non-contributory, but patients were symptomatic on review: Patients were subjected to diagnostic laparoscopy. Non appendiceal pathology detected on laparoscopy, treated accordingly

Group III– Investigations were non-contributory, but patients were symptomatic on review: Patients were subjected to diagnostic laparoscopy. If no obvious non-appendicial pathology was detected, appendicectomy was done irrespective of visual assessment of appendix. Histopathological examination of Appendicectomy specimen performed.

Group IV- Investigations were non-contributory, but patients were asymptomatic: Followed up monthly.

All these patients were followed up monthly to determine the outcome.

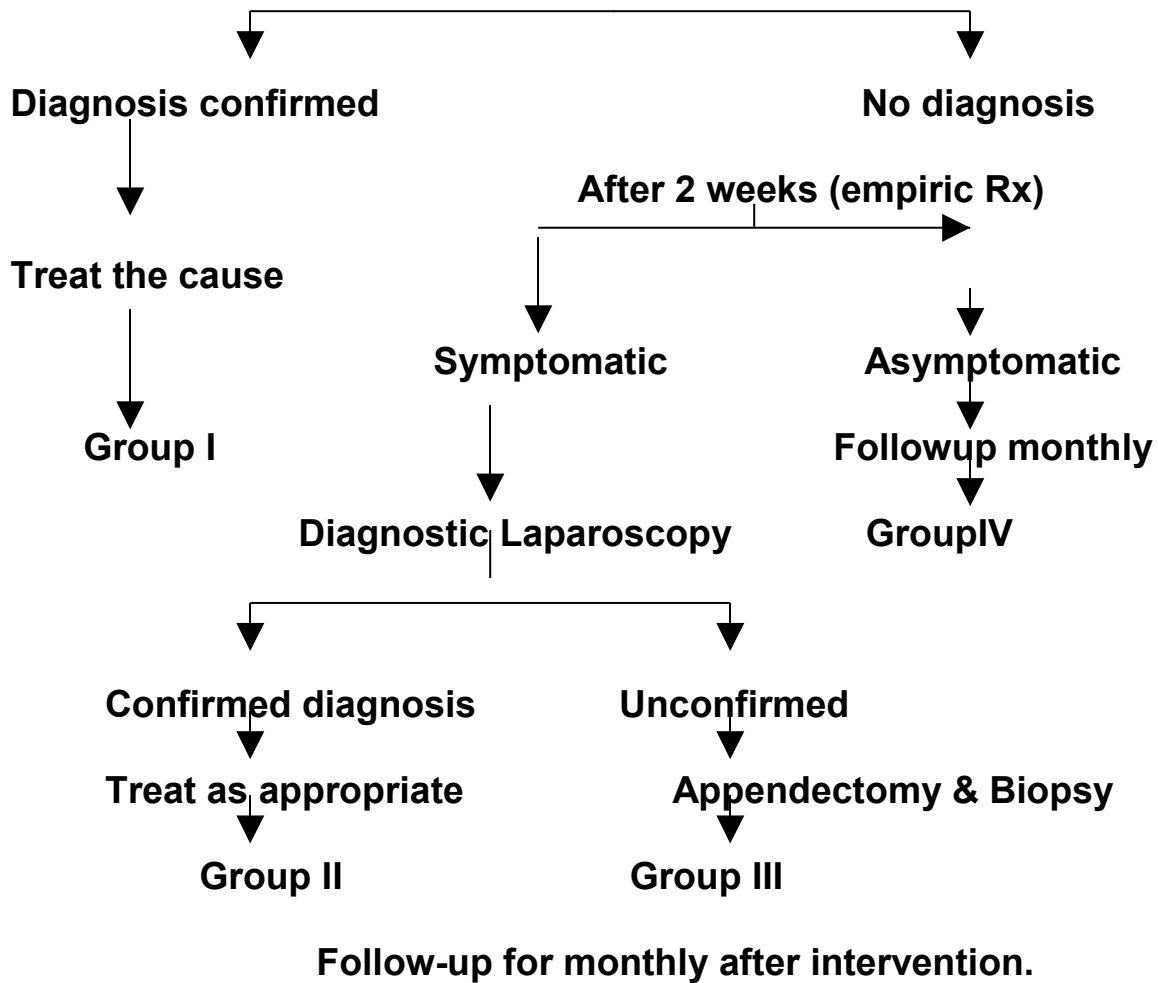
Algorithm

Abdominal Pain > 2 weeks



History, examination, Investigations





RESULTS

Study was carried over a period of 6 months from August 2005 to January 2006.

Patients were followed up monthly after intervention.

Demography:

Total number of cases: 60
Males: 32
Females: 28
Male:Female ratio: 1.14: 1
Age: 3 years to 12 years

Duration of Symptoms:

Range: 15 days to 5 years

Mean: 6.7 months

Duration of Follow-up:

Range: 45days to 7 months

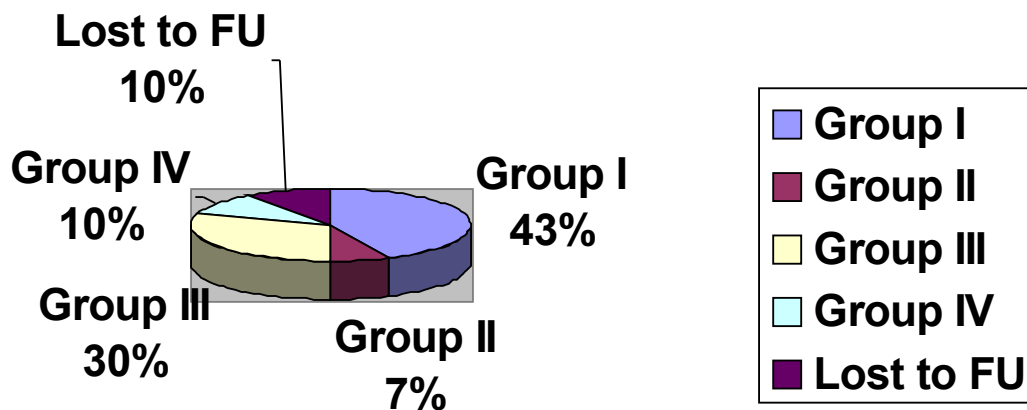
Mean: 4. 1 month

Distribution of cases in various groups:

<u>Group</u>	<u>No. of Cases</u>	<u>Percentage</u>
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I	26	43.3%
II	4	6.6%
III	18	30.0%
IV	6	10.0%
Lost to follow-up	6	10.0%

Distribution of cases in each group



Group I: This group includes all patients who were diagnosed to have organic disease by history, physical examination and investigation only.

Number of cases : 26

Pathologies in Group I

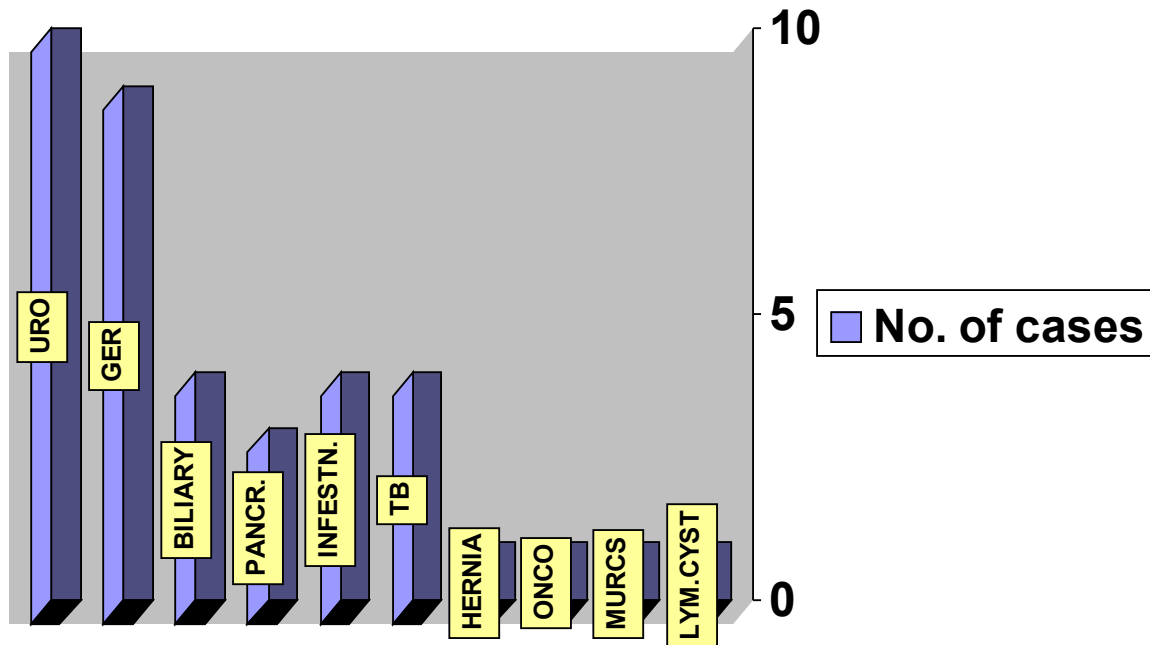


Table showing the distribution of pathologies diagnosed in this group:

Pathology	Number of cases
Urological	9
Gastrointestinal	1
Hepato-biliary	4
Pancreatic	4
Fatty hernia of linea alba	1
Worm infestation	1

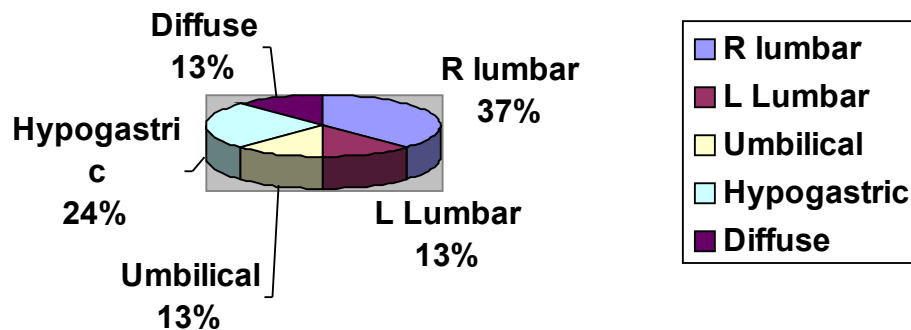
Giardiasis	2
Amoebiasis	1
Oncological	1
Extra-abdominal	
Pulmonary Tuberculosis	1
Rare diagnosis	
MURCS Syndrome	1
Retroperitoneal cyst	1

Group I (a) Urological pathologies:

Number of cases: 9

Symptomatology:

Site of Pain



Associated symptoms:

No. of cases- 5

Vomiting - 4

Fever - 3

Urinary symptoms - 2

Physical examination findings:

Localized Tenderness - 5

Mass - 1 (PUJ obstruction in pelvic kidney)

Investigations:

Positive Urine routine examination - 1

Positive Urine Culture - 2

Ultrasonogram diagnostic - 8

MCU diagnostic (VUR)- 1

Table shows urological pathologies and confirmatory investigations:

Pathology	Diagnostic investigation	Number of cases
Urolithiasis		
Pelvic calculus, unilateral	Ultrasonogram	2
Pelvic calculi, bilateral	Ultrasonogram	1
Mid ureteric calculus	Ultrasonogram	1

Pelvi-ureteric junction obstruction	Ultrasonogram	2
PUJ obstruction- Ectopic kidney	Ultrasonogram	1
Xanthogranulomatous nephritis	Ultrasonogram	1
Vesico-ureteric reflux	MCU	1

Ultrasonogram was diagnostic in 88.8% of the cases.

Table showing the therapeutic options used in these patients:

Diagnosis	Management	Number of cases
PUJ Obstruction	Pyeloplasty	2
Pelvic Calculus	Pyelolithotomy	3
Ureteric Calculus	Ureterolithotomy	1
Xanthogranulomatous nephritis	Lap. → Open Nephrectomy	1
VUR	Conservative	1
Hydronephrosis	Conservative	1

Outcome:

Duration of Follow-up : 3 months to 7 months.

All patients are asymptomatic.

Group I (b): Gastrointestinal Pathology:

Number of cases: 1

Diagnosis: Malrotation of gut

This was an interesting case of a 12 year old patient presenting with h/o recurrent diffuse abdominal pain of 5 years duration associated with non-bilious vomiting.

Physical Examination: Non-contributory.

Investigations:

Blood and urinary investigations: Non-contributory

Diagnostic Investigation:

USG Abdomen: Reversal of Superior Mesenteric Artery and Superior Mesenteric Vein axis.

Barium Meal: Dilated stomach with absence of C- loop of duodenum.

Management:

Laparoscopic Ladd's procedure: Three ports. Umbilical 10 mm port for 30-degree telescope. No volvulus. Ladd's band released. Duodenum straightened. Ileo-colic isthmus widened. Laparoscopic appendicectomy done.

Outcome:

Duration of follow-up: 7 months

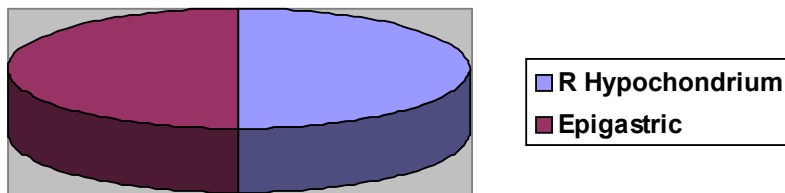
Remained asymptomatic for 6 months. Had one episode of omphalitis with pain at the umbilical scar site. Managed conservatively.

Group I (c) Hepatobiliary:

Number of cases: 4

Symptomatology:

Site of pain



Associated Symptoms:

No. of cases - 2

Jaundice - 2

Vomiting - 1

Physical Examination:

Palpable gall bladder - 1

All others were non-contributory

Investigations:

Blood and urinary investigations – Non-contributory.

Ultrasonogram - Diagnostic in all

Table showing the pathologies and the confirmatory investigation

Diagnosis	Diagnostic investigation	No. of cases
Cholelithiasis	Ultrasonogram	2
Gall bladder polyp	Ultrasonogram	1
Choledochal cyst	Ultrasonogram	1

Management:

Table showing the surgeries done for hepato-biliary pathologies

Diagnosis	Procedure	No. of cases
Cholelithiasis	Laparoscopic Cholecystectomy	2
Gall bladder polyp	Laparoscopic Cholecystectomy	1
Choledochal cyst	Cyst excision and hepatico-jejunostomy	1

Outcome:

Duration of follow-up: 4 to 6 months

All are asymptomatic

Group I (d) Pancreatic pathology

Number of patients: 3

Symptomatology

Site of Pain: Epigastric region

Associated symptoms

Present in all

Vomiting, nausea and loss of weight.

Investigations

S. Amylase – Elevated in one case

Blood investigations - Otherwise non-contributory.

USG Abdomen: Diagnostic in all

Table showing diagnosis and the confirmatory investigation

Diagnosis	Diagnostic investigation
1. Pancreatitis	Ultrasonogram
2. Chr. calculous pancreatitis	Ultrasonogram
3. Pancreatitis with pseudocyst	S. Amylase and Ultrasonogram

Management:

Diagnosis	Treatment
1. Pancreatitis	Conservative
2. Chr. calculous pancreatitis	Lateral pancreatico-jejunostomy
3. Pancreatic pseudocyst	Conservative

Outcome:

Duration of Follow-up: 3 months to 5 months

Patient 1 - Asymptomatic.

Patient 2 - Presented with one episode of adhesive obstruction, which

resolved with conservative management. Serum amylase was normal.

Abdominal x-ray showed dilated small bowel loops.

Patient 3 - Presented with recurrent pancreatitis and was hospitalized. Serum amylase was elevated and ultrasonogram showed persistent pseudocyst. Patient is on follow-up.

Group I (e) Ventral hernia of linea alba:

Number of cases: 1

This was an 11-year-old female child who presented with h/o recurrent episodes of epigastric pain of one-month duration. Patient was hospitalized previously and treated as gastritis.

Associated symptoms. Nil

Physical examination:

Repeated examination revealed a linea alba defect with fatty hernia that was tender.

Investigations:

Blood investigations were within normal limits.

UGI scopy ruled out acid peptic disease.

Management: Anatomical repair.

Outcome:

Patient is asymptomatic.

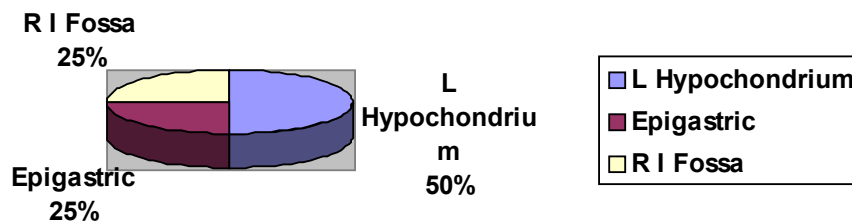
Duration of follow-up – 7 months

Group I (f) Bowel infections and infestations:

Number of cases: 4

Symptomatology:

Site of pain



Associated symptoms:

Present in all patients

Loose stools – 2

Fever – 2

H/o passing worms – 1

Physical examination: Localised tenderness at the site of pain in all.

Investigations:

Blood Investigations: Non contributory

Motion examination: Diagnostic in all

Diagnosis and Diagnostic investigation:

Diagnosis	Diagnostic investigation	Number of cases
Giardiasis	Motion routine exam	2
Amoebiasis	Motion routine exam	1
Worm infestation	Motion routine exam	1

Management: Antiparasitic drugs orally.

Outcome: All are symptom free.

Group I (g) Pulmonary Tuberculosis:

Number of patients: 1

Symptomatology: Epigastric pain of one month duration.

Investigations:

Blood investigations – non contributory

Mantoux – Positive

USG Abdomen – Normal

Chest X-ray – Pulmonary tuberculosis

Management: Anti-tuberculous treatment.

Group I (h) Retroperitoneal Cyst:

Number of patients: 1

Symptomatology:

This was a 11 year old female child who presented with h/o recurrent right lower quadrant abdominal pain of 1 year duration associated with fever.

Physical examination:

Initial examination revealed right iliac fossa tenderness. Subsequently she was noted to have a progressively enlarging tender lump in the right iliac fossa.

Investigations:

Blood investigations were non-contributory.

Ultrasonogram: Cyst measuring 18 by 11 cm with internal septations.

CT Scan: Retroperitoneal lymph Cyst.

Diagnostic investigation: Ultrasonogram

Management: Laparoscopic cyst excision.

Histopathology: Cystic lymphangioma

Outcome:

Duration of follow-up: 3 months

Patient had following complications in the immediate postoperative period:

A) Prolonged lymphatic drainage from the drain site

B) Omental prolapse from the drain site which required reposition under GA.

Presently patient is asymptomatic.

Group I (i) Neuroblastoma:

Number of cases: 1

Symptomatology:

This was a 4 year old female child who presented with h/o epigastric pain and fever of 3 months duration. Previous h/o hospitalization for similar complaints.

Physical Examination:

General Examination: Febrile and anaemic

P/A: Tender epigastric mass.

Investigations:

Hb% - 7.5 gm%

USG abdomen: Retroperitoneal mass with mesenteric nodes

CT abdomen: Retroperitoneal mass

Management:

Mini-laparotomy and biopsy.

Histopathology:

Neuroblastoma

Outcome:

Patient on follow-up receiving neoadjuvant chemotherapy.

Duration of follow-up: 3 months.

Group I (j) MURCS Association:

Number of cases: 1

Symptomatology:

This was a 12 year old female child presenting with h/o recurrent lower abdominal pain of 3 months duration. No associated symptoms were present.

Physical examination:

Torticollis

Left iliac fossa and hypogastric tenderness.

Upper vaginal atresia. Vagina admits a dilator only upto 2 cm.

Investigations:

Blood investigations: Non-contributory

Ultrasonogram: Vaginal atresia with infantile uterus and left hydrosalpinx. Dysplastic right kidney.

X-ray Cervical spine: Hypoplasia of C5 to T1

Diagnostic investigations: Ultrasonogram, cervical spine x-ray

Management:

Laparoscopic Left Salpingectomy

Laparoscopic Right Nephrectomy

Regular vaginal dilatation

Outcome: Duration of Follow-up: 6 months

Patient has recurrence of lower abdominal pain. Repeat ultrasonogram has shown normal right salpinx and no intrauterine collection. Patient is on symptomatic treatment. Patient is on follow-up.

Group II

Table showing the pathologies diagnosed by diagnostic laparoscopy.

Pathology	Number of cases
Gastro-intestinal	
Meckel's Diverticulum	1
Infective	
Tuberculosis of abdomen	3

Group II (a) Meckel's Diverticulum:

Duration of symptoms: 2 years

Symptomatology: Diffuse pain

Associated symptoms: Bilious vomiting and melena

Physical Examination: Non contributory

Investigations:

Blood investigations: Normal

USG abdomen: Normal study

Barium meal: Normal study.

Diagnostic Laparoscopy: Meckel's diverticulum seen. Appendix appeared normal

Management: Laparoscopy assisted diverticulectomy.

Histopathology: Ileal type of mucosa. No inflammation.

Outcome:

Hospitalised after 1 month of surgery with h/o upper abdominal pain and bilious vomiting.

Investigation repeated

S. Amylase : Elevated

Ultrasonogram: Pancreatitis.

Patient recovered on conservative management. Patient is on follow-up without recurrence.

Group II (b) Abdominal Tuberculosis:

Number of patients: 3

Duration of Symptoms: 15 to 20 days

Symptomatology:

Site of Pain: Diffuse in all

Associated symptoms:

Present in all patients

Fever - 2

Loss of weight - 1

Abdominal distension - 1

Physical Examination:

All were malnourished.

Free fluid - 2

Abdominal wall Nodules - 1

Investigations:

Blood investigations: Normal in all

Mantoux: Negative in all

Ultrasonogram:

Free fluid - 3

Mesenteric thickening - 1

Diagnostic Laparoscopy:

All patients had the following findings -

Multiple parietal and peritoneal tubercles.

Free fluid.

Biopsy obtained.

Histopathology: Epitheloid cell granuloma with caseous necrosis in the center.

Langhan's type giant cells. Suggestive of abdominal tuberculosis.

Diagnostic investigation: Diagnostic laparoscopy and Histopathology.

Management: Anti-tuberculous treatment.

Outcome:

Patients are improving. On ATT drugs.

Duration of follow-up: 2 – 4 months.

Group III:

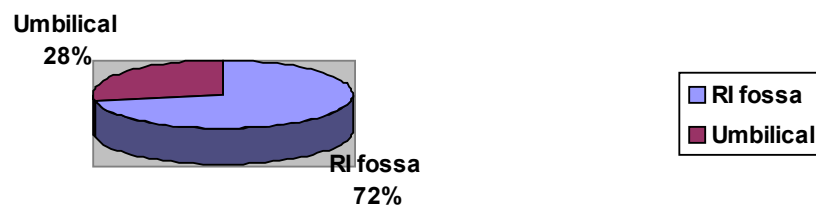
Number of patients: 18

Duration of symptoms: Range: 15 days to 4 years

Mean: 6.4 months

Symptomatology:

Site of pain



Associated symptoms were present in 8 patients

Vomiting – 5

Fever - 2

Urinary symptoms – 2

Passage of worms – 1

Bleeding per rectum – 1

Physical Examination:

Localised tenderness at the site of pain – 17

No tenderness - 1

Investigations:

Blood Investigations:

Total count elevated in 2 patients

Others were non-contributory

Additional investigations

Urine C/S done in 3 patients. All were sterile.

Barium enema and Meckel's scan done in one patient who presented with bleeding per rectum. Both were within normal limits.

Diagnostic laparoscopy:

Inflamed appendix on visual assessment: 11

Normal appendix on visual assessment: 07

Management: All of them underwent appendicectomy.

Table comparing visual appearance of appendix and histopathology:

	Chronic Appendicitis (HPE)	Acute Appendicitis (HPE)	Normal Appendix (HPE)
Inflamed Appendix (Laparoscopic) (11)	8	3	0
Normal Appendix (Laparoscopic) (7)	4	2	1

This table shows that 6 of the 7 (85.7%) normal looking appendices were inflamed.

Outcome:

Duration of Follow-up:

Range: 2 months – 7 months

Mean: 3.2 months

Four patients had minor complications in this group.

Table showing complication rates of appendiceal pathology

Histopathology of Appendix	Complications	Number of cases
Chronic Appendicitis	Port site infection	3
Normal Appendix	Port site infection	1

Table showing the outcome in the patients in relation to HPE

Histopathology of Appendix	Symptomatic after Appendicectomy (No.)	Asymptomatic after appendicectomy(No.)
Chronic Appendicitis	1	11
Acute Appendicitis	0	5
Normal Appendix	0	1

Group IV:

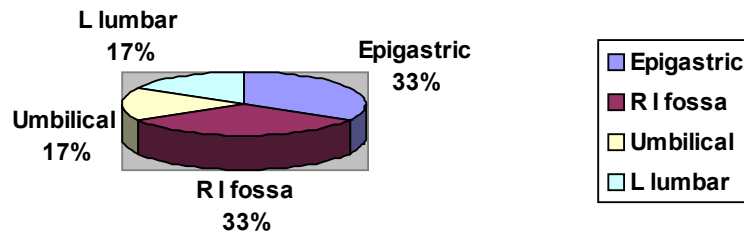
Number of patients: 6

Symptomatology:

Duration of symptoms: Range: 20 days to 1 year

Mean: 3.3 months

Site of pain



Associated Symptoms:

Present in 4 patients:

Vomiting	– 2
Fever	– 2
Loose stools	– 1
Urinary Symptoms	– 1

Physical Examination:

Localized tenderness at the site of pain was present in all.

Investigations:

Blood investigations: within normal limits

Urine C/s done in one patient was sterile

USG Abdomen:

Normal	-5
Mesenteric adenitis	-1

Management:

Albendazole in all patients.

H₂ receptor blockers in 2 patients

Outcome:

All patients are asymptomatic

Duration of follow-up – Mean of 4 months

Clinical Diagnosis:

Acid peptic disease – 2

Non-specific abdominal pain – 4

Provisional diagnosis:

Nonspecific abdominal pain – 6

Lost to Follow- up Group:

Number of patients: 6

Duration of Symptoms: 15 days to 2 years

Symptomatology:

Associated symptoms:

Present in 5 patients

Vomiting – 3

Fever	– 3
Loose stools	– 1
H/o passing worms	– 1

Physical Examination: Non contributory

Investigations:

USG Abdomen:

Mesenteric adenitis	– 3
Normal	– 3

Empiric treatment:

All patients received Albendazole. Patients with mesenteric adenitis received Antibiotics also. Diagnostic laparoscopy was suggested in all as they were symptomatic.

DISCUSSION

Chronic abdominal pain is common in children. It is important for the physician to correctly diagnose children with organic disorders and treat them accordingly. As already mentioned most of the available literature on chronic abdominal pain has come from studies conducted by medical colleagues. The subcommittee on Chronic abdominal pain of the American Academy of Pediatrics⁴ and the North American Society for Pediatric Gastroenterology, Hepatology and Nutrition has prepared a report based on a comprehensive systematic review and rating of 64

articles^{9,10,11,12} found in English literature. This subcommittee has examined the diagnostic and therapeutic value of history, diagnostic tests and empiric therapy. This discussion mainly compares this study with the consensus report. There is a wide variation in observations between the published literature and this study. Another paper from John Hopkins University School of Medicine² which was not included in the above mentioned review of the subcommittee has clearly defined chronic abdominal pain and explained the five components for evaluation of children with abdominal pain. These as already mentioned include history, physical examination, laboratory tests, imaging studies and empiric intervention. Both the above papers have mentioned functional disorders as a common reason for this pain. But in this study we did not find adequate reason to subject the patients to routine psychological assessment as the incidence of organic disease detected in the course of this study was high.

Literature from studies by paediatric surgeons^{6,7,8} have clearly established the diagnostic yield of laparoscopy in these children. Hence we proceeded to subject our patients to diagnostic laparoscopy in this study.

The following discussion focuses on the diagnostic yield of history, physical examination, investigations and diagnostic laparoscopy and compares them with the available literature.

Symptomatology:

There is no literature⁴ emphasising the significance of pain frequency or

duration of pain in pointing to the diagnosis. The same has been noted in our study also. The following table shows the duration of symptoms seen in the various groups.

Duration of symptoms:

	Range	Mean (Months)
Group I	15 days – 5 years	10.8
Group II	15 days – 2 years	6.5
Group III	15 days – 4 years	6.4
Group IV	15 days – 1 year	3.4

Recognisable pattern of clinical symptoms and signs were seen in patients with hepatobiliary, pancreatic and appendicial pathologies. This accounted for 50% of the patients. No specific pattern was noted in others. Patients with hepatobiliary disease presented with typical right hypochondriac and epigastric pain or tenderness. Pain was localized to the epigastrium in pancreatic pathology. Patients who had undergone diagnostic laparoscopy and were detected to have appendicial pathology had pain and tenderness localized to the right iliac fossa or umbilical region.

According to the consensus report from the subcommittee on chronic abdominal pain, site of pain or tenderness did not help in pointing to the diagnosis in these patients

Studies^{8,9,13,14} have shown that persistant right lower quadrant pain is indicative of appendiceal pathology and hence there is justification in doing

appendicectomy in these patients^{15,16,17}. . In this study 50% of the patients had a recognizable pattern of symptoms pointing to the diagnosis.

Associated symptoms have been given importance in the subcommittee report. To quote from the paper by the subcommittee – ‘ the presence of alarm symptoms or signs may suggest a higher likelihood of organic disease and is an indication for the performance of diagnostic tests, whereas in the absence of alarm symptoms, diagnostic studies are unlikely to have a significant yield of organic disease’. Alarm symptoms mentioned are weight loss, gastrointestinal bleeding, persistent fever, chronic severe diarrhea and vomiting. In this study associated symptoms were present in 33 of the 60 patients. Organic disease was diagnosed in 47 patients (78.3%). In this diagnosed group only 24 patients had associated or alarm symptoms which accounted for only 49.6%. These were vomiting, fever, loss of weight, jaundice, loss of appetite and urinary symptoms. This is also in contrast to the literature. This study has not denied investigations based on the presence or absence of alarm symptoms.

Physical findings:

Positive physical findings were present in 45 of the 60 patients which constitutes to 75%. . Positive physical signs were:

Tenderness –

36

Mass -	4
Hernia -	1
Torticollis & Vaginal atresia -	1
Abdominal nodules -	1
Free fluid -	1

Positive physical findings were present in 76.1% of cases with organic disease.

It was diagnostic in one case who had ventral hernia of linea alba. This stresses the need for careful and sometimes repeated examination of patients.

When more than one finding is present, syndromes have to be considered. As in this study there was a case of MURCS association^{18,19,20} which has the following components, ie Mullerian hypoplasia/aplasia, renal agenesis and cervicothoracic somite dysplasia. This syndrome is emerging as the second most frequent cause of primary amenorrhoea²¹. The patient in this study was of 12 years who presented only with complaints of lower abdominal pain. Though torticollis was present since birth the patient did not complain.

Yield of Investigations

Compulsory Investigations

Investigations	No of cases	Number abnormal	Percentage abnormal
Complete Haemogram	60	3	5%
Serum Amylase	60	1	1.6%
ESR	60	0	0%

Urine Routine	60	3	5%
Motion Routine	60	4	6.6%
Mantoux Test	60	1	1.6%
USG Abdomen	60	26	43.3%

Though the above mentioned investigations showed values outside the normal range in several cases, with the exception of motion routine and ultrasonogram the other investigations did not contribute to the final diagnosis significantly.

Complete haemogram was only an indicator of the general condition.

Serum amylase though positive in one only case, was diagnostic and hence is of value. But negative serum amylase cannot be considered to rule out pancreatitis^{22,23}. This study had three patients with pancreatitis, serum amylase was diagnostic in only one patient. In pancreatitis, amylase is only transiently elevated during acute episodes and returns to normal within 48 hrs. In chronic pancreatitis there may not be enough pancreatic tissue to secrete amylase and hence may not show abnormal values even during acute episodes. Moderate elevation is usually seen in patients with pancreatic pseudocyst. Still due to the rarity of pancreatitis in children, this diagnosis is often missed. Hence it is worthwhile to subject all the patients to serum amylase assessment as a routine. It should be kept in mind that serum amylase is non-specific and can be elevated in various pathologies.

ESR did not contribute to the diagnosis in any patients.

Urine routine examination contributed to diagnosis in 5% of patients but was not diagnostic in any case.

Motion routine examination in this setting seems to be mandatory. It was positive in only 6.6% but diagnostic in all. The yield of this may be less because most of the patients receive antihelminthic drugs before seeking a paediatric surgical consultation.

Ultrasonogram of abdomen and pelvis is a painless, noninvasive and inexpensive test that can detect abnormalities of the kidneys, gallbladder, liver, pancreas, appendix, intestines, ovaries and uterus. Yield of this investigation in published literature is about 10% in evaluating chronic abdominal pain²⁴. But in our study it has a very good yield of 43% and was by itself diagnostic in 41.7%. Hence based on this study ultrasonogram is a must in evaluating patients with chronic abdominal pain.

Optional investigations and their yield:

Investigations	Number of cases	Number positive
Urine C/S	10	2
Chest x-ray	1	1
MCU	1	1
Barium meal	1	1
Meckel's scan	2	0

Confirmatory diagnostic modalities in Chronic abdominal pain

Final diagnosis was established with clinical examination, investigation and diagnostic laparoscopy in totally 47 of the 60 patients. 7 of the 60 patients are on follow-up and asymptomatic with no specific diagnosis and hence termed as non-specific abdominal pain. One of the patients in this NSAP group was subjected to diagnostic laparoscopy and appendicectomy. Histopathology showed normal appendix and hence was included in the NSAP group. 6 of the 60 patients were lost to follow-up. Following table shows the factors contributing to the diagnosis in the 47 patients with established diagnosis.

Factors that have contributed to the final diagnosis:

Investigation	Number of cases	Percentage
Ultrasonogram	19	41.7%
Diag Laparoscopy	15	25%
Chest x-ray	1	2.1%
Clinical examination	1	2.1%
MCU	1	2.1%

As already mentioned ultrasonogram is indispensable in investigating chronic abdominal pain.

Role of diagnostic laparoscopy^{7,8} has been established in literature by studies

from paediatric surgeons. The diagnostic yield has varied in different reported series. Common diagnosis mentioned have been appendiceal pathology, Meckel's diverticulum, adhesions and tuberculosis of the abdomen. This study has also detected cases with all the above mentioned pathologies using laparoscopy.

Are we justified in doing appendicectomy in Chronic abdominal pain?

There are controversies persisting regarding the entity of Chronic appendicitis. Pathological chronic appendicitis is an established entity now. Initially there was criticism regarding appendectomy²⁵ in an otherwise normal looking appendix. A study from Kraemer et al²⁶ has categorically mentioned that there is no role for appendicectomy in these patients unless a pathology is detected. But subsequent studies from various centers have proved that diagnostic laparoscopy and appendicectomy is the treatment option for patients with chronic abdominal pain especially those localized to right lower quadrant. A study by Stringel et al⁶ mentions management of 13 patients with appendicectomy of whom 10 are asymptomatic following this procedure. Two of them required second laparoscopy for adhesion related pain. Another similar study by Mahomed et al has mentioned 11 cases undergoing appendicectomy with 8 of them becoming asymptomatic. Parikh et al have mentioned 2 cases of unsuspected tuberculosis of the appendix^{27,28} as cause of pain. Complications

related to laparoscopy were minimal in these studies.

In this study, we had 18 patients undergoing appendicectomy. Histopathology has revealed acute or chronic appendicitis in 17 of these patients. 16 of these patients are asymptomatic. 1 patient has presented with history suggestive of adhesive colic repeatedly and was managed conservatively. This patient may require a second laparoscopy. 1 of the 18 patients showed normal appendix on histopathology, the patient is asymptomatic on follow-up and included in the non-specific abdominal pain group.

Complications after appendicectomy were seen in 4 of the 18. They developed port site infections which resolved with antibiotics.

Role of Laparoscopy in the management of patients with chronic abdominal pain

The role of Laparoscopy^{29,30,31} in diagnosis has already been discussed. Table showing the therapeutic role of laparoscopy

	Number of cases	Percentage
Diagnostic	3	5%
Diagnostic & Therapeutic	19	31%
Therapeutic	7	11.6%
Total	29	48.3%

Role of Surgery in Chronic abdominal pain:

Surgery was needed in 30 of the 60 patients for either diagnosis or management in this group.

Differential diagnosis of patients with chronic abdominal pain in our study

This study detected organic disease in 47 of the 60 cases (78.3%). 7 of the 60 have been labeled as non-specific abdominal pain as there is no conclusive diagnosis. These patients are asymptomatic and on follow-up. If symptoms recur, they will be subjected to diagnostic laparoscopy. 6 of the patients were lost to follow-up.

S.No.	Pathology	Number of cases	Percentage
1	Gastrointestinal	19	31.6%
2	Urological	3	5%
3	Hepatobiliary	4	6.6%
4	Pancreatic	3	5%
5	Tuberculosis	4	6.6%
6	Oncological	1	1.6%
7	Int. infestations	4	6.6%
8	Rare diagnosis		
	MURCS	1	1.6%
	Lymph cyst	1	1.6%

9	NSAP	7	11.6%
10	Lost to follow up	6	10%

Outcome

Duration of follow up : 2 months to 8 months.

Number of asymptomatic cases after treatment: 42

Number of symptomatic cases after treatment: 05

Symptomatic cases:

1. MURCS associations: Presented with recurrent lower abdominal pain.

Clinical examination was non-contributory. Repeat ultrasonogram showed normal right fallopian tubes, infantile uterus with no endometrial collection.

This patient is on follow-up with symptomatic treatment.

2. Pancreatitis: Two of the patients returned with symptoms. One who underwent lateral pancreatico-jejunostomy presented with adhesive obstruction confirmed by clinical examination and abdominal x-ray.

Patient improved with conservative management.

Another patient with pseudocyst has persistent symptoms and pseudocyst. Presented with acute exacerbation of pancreatitis confirmed by serum amylase. Conservatively managed and on follow-up.

3. Post Appendicectomy: One patient who underwent appendicectomy following diagnostic laparoscopy presented with repeated episodes of right lower quadrant pain. Histopathology of appendix had shown chronic inflammation. On conservative management now. May need a second laparoscopy.
4. Malrotation: This patient presented with one episode of omphalitis and tenderness at the umbilical scar. Resolved with antibiotics.
5. Meckel's diverticulum This patient presented with history of bilious vomiting and upper abdominal pain. Investigations revealed elevated serum amylase and sonographic evidence of pancreatitis. Patient improved with conservative management.

These instances insist the need for re-evaluating these patients completely if they present with a second episode, especially if the patient has been symptom free in the intervening period.

CONCLUSION

1. Chronic abdominal pain in children needs a complete and thorough evaluation with various modalities of deserving investigations, but a proper history and clinical examination are indispensable.
2. A majority of our patients (78%) had organic pathology revealed by protocolised evaluation.
3. The commonest cause of chronic abdominal pain is due to gastrointestinal pathology followed by urological pathology. Rare pathologies also should be considered.

4. Ultrasonography has the highest diagnostic yield among investigations. It is a non-invasive, inexpensive, easily available test, which can be done as an outpatient procedure. USG should be done as a routine in all cases.
5. In the modern era, diagnostic laparoscopy surely has a place in evaluating these patients. It gives better diagnostic yield, can be therapeutic, is less painful post-operatively and is cosmetically acceptable. It was therapeutic in 43.3% of our cases.
6. Congenital anomalies like Malrotation, Choledochal cyst, MURCS association, Retroperitoneal lymph cyst can present even at an older age.
7. Unsuspected tuberculosis is still prevalent in Indian scenario.
8. As against common Paediatric practice, pancreatic pathology and urolithiasis should be considered as a diagnosis in children.
9. Delay in diagnosis and treatment of oncological pathologies can be avoided by early evaluation.
10. Chronic appendicitis is an established entity and should be considered as a differential diagnosis in all these patients, especially if presenting with chronic right lower abdominal pain.

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Proforma

S. No.	Name	Age/Sex	I.P. No.
Address	Date of registration:		D.O. Surgery:
History:			
Durations of symptoms:		Aggravating factors:	
Site of pain:			
Relieving factors:			
Associated symptoms:			
Vomiting: Yes/No		Loss of weight: Yes/No	
Loose stools: Yes / No		H/o Passage of worms:	
Fever: Yes /No		Yes/No	
Physical Examination:			
Palor: Yes/No		Icterus: Yes/ No	

Lymphadenopathy: Yes/No Temp.-

Pulse:

CVS:

RS:

Abdominal site of tenderness / Mass:

PR:

Investigations:

Complete haemogram:

Urine RE

S. Amylase:

Motion RE

Mantoux:

ESR:

USG Abdomen:

Optional investigation:

Empiric Treatment:

Albendazole: Yes/ No

Antibiotics: Yes / No

Others: Yes /No

Surgery: Yes / No

Provisional Diagnosis:

If Yes:

D.O.S.:

Procedure:

Findings:

HPE :

Final Diagnosis:

Master Chart

S. No.	Name	Age/Sex	IP/OP.No	Diagnosis
1.	Praveen	6y/M	61470	Lt. Hydronephrosis
2.	Nithya	8y/ F	48595	Rt. PUJ Calculus
3.	Manikantan	9y/ M	7257	Bil. Hydronephrosis
4.	Nandhini	4y/ F	5502	Lt.VUR
5.	Sabarulla	11y/ M	40740	Bil. Renal calculi
6.	Revathy	11y/ F		Rt. Renal calculus
7.	Sanjay	3y/ M	63566	Bil. Renal calculi
8.	Moorthy	8y/ M	2824	Rt. Hydronephrosis
9.	Prakash	8y/ M	42346	Rt. Xanthogranulo- matous nephritis
10.	Akkitha	12y/ F	42344	Malrotation
11.	Karthika	11y/ F	45015	Linea alba hernia

12.	Thabia	12y/ F	8284	GB polyp
13.	Parveen	11y/ F	50953	Cholelithiasis
14.	Manimegalai	7y/ M	40839	Choledocholithiasis
15.	Nishanth	3y/ M	50923	Choledochal cyst
16.	Tamilselvan	11y/ F	2081	Retroperitoneal cyst
17.	Manoriba	4y/ F	3442	Neuroblastoma
18.	Kokila	12y/ F	5277	MURC Syndrome
19.	Sukanya	9y/ M	44939	Pancreatitis
20.	Vijayakumar	12y/ M	46717	Chronic Pancreatitis
21.	Meiyarasan	12y/ F	6046	Pancreatitis
22.	Benazir	12y/ M	6174	Amoebiasis
23.	Gangadharan	11y/ M	6641	Giardiasis
24.	Nagaraj	3y/ F	6551	Giardiasis
25.	Amida Parveen	12y/ M	6759	Pulmonary TB
26.	Sivakumar	7y/ F	5193	Worm infestation
27.	Arifa	12y/ F	59218	MecklesDiverticulum
28.	Vinitha	12yr/ M	53970	TB abdomen
29.	Perumal	10y/ F	3749	TB abdomen
30.	Jayabarathi	9y/ M	5900	TB abdomen
31.	Manoj	11y/ F	43554	Chronic Appendicitis
32.	Nandhini	11y/ M	42937	Chronic Appendicitis

33.	Sabarigiri	9y/ M	5046	Chronic Appendicitis
34.	Sivasakthi	10y/ M	45255	NSAP
35.	Anandhakumar	11y/ M	5111	Chronic Appendicitis
36.	Mohan Kumar	9y/ M	44382	Chronic Appendicitis
37.	Thoufiq	12y/ F	45932	Chronic Appendicitis
38.	Suganthimani	9y/ F	45765	Chronic Appendicitis
39.	Soundharya	8y/ M	5879	Chronic Appendicitis
40.	Mohan	7y/ M	4424	Chronic Appendicitis
41.	Askar Hussain	12y/ F	62527	Chronic Appendicitis
42.	Vaidheeshwari	6y/ F	7072	Chronic Appendicitis
43.	Nagadurga	12y/ F	7225	Chronic Appendicitis
44.	Thabeera	9y/ F	7249	Chronic Appendicitis
45.	Manjula	9y/ M	51429	Chronic Appendicitis
46.	Sheik Moideen	11y/ M	42268	Chronic Appendicitis
47.	Nandagopal	12y/ F	60890	Chronic Appendicitis
48.	Kalaiarasi	10y/ M	62342	Chronic Appendicitis
49.	Srinivasan	11y/ M	5194	NSAP
50.	Hariprakash	9y/ M	4838	APD
51.	Keerthi	10y/ F	6353	NSAP
52.	Rani	11y/ M	6365	NSAP
53.	Vignesh	11y/ M	487	NSAP

54.	Divakar	9y/ F	6599	APD
55.	Restyl Mary	11y/ M	3744	Lost to follow-up
56.	Sathish Kumar	8y/ F	5073	Lost to follow-up
57.	Soniya	10y/ M	5843	Lost to follow-up
58.	Gokulkumar	9y/ F	6216	Lost to follow-up
59.	Nandhini	9y/ M	6810	Lost to follow-up
60.	Ukesh	11y/ F	5973	Lost to follow-up